Claims

1. A polynucleotide selected from the group consisting of:

(a) a polynucleotide having the nucleic acid sequence of SEQ ID NO: 54, 55, 58, 59, 62, 63, 66, 67, 70, 71, 74, 75, 78, 79, 82, 83, 86, 87, 90, 91, 94, 95, 98, 99, 102, 103, 106, 107, 110, 111, 118, 119, 122, 123, 126, 127, 128, 134, 138, 144, 146, 148, 150, 151, 152, 153, 154, 156, 157, 159, 161, 162, 163, 164 or 171;

(b) a polynucleotide encoding a polypeptide having the amino acid sequence of any one of SEQ ID NO: 129, 135, 139, 145, 147, 155, 158, 160 or 172;

(c) a polynucleotide encoding a CYP3A4 or CYP3A7 polypeptide, wherein said polynucleotide is having at a position corresponding to any one of position 6004, 13908, 14292, 14304, 14323, 14329, 14357, 15753, 20230, 21867, 21868, 21896, 22026, 22041, 23081, 23172, 25925 or 25958 of the CYP3A4 gene (Accession No: AF280107, whereby the nucleotide A of the first ATG encoding the CYP3A4 protein has been taken as position 1) or at a position corresponding to position 1229 of the CYP3A7 (Accession No: gi4503232) a nucleotide exchange, a nucleotide deletion, an additional nucleotide or an additional nucleotide and a nucleotide exchange, wherein said nucleotide deletion at a position corresponding to position 23172 is not resulting in an M to T amino acid substitutuion or is not a T to C nucleotide exchange;

(d) a polynucleotide encoding an CYP3A4 or CYP3A7 polypeptide, wherein said polynucleotide is having at a position corresponding to any one of position 6004, 13908, 14292, 20230 or 21868 of the CYP3A4 gene (Accession No: AF280107, whereby the nucleotide A of the first ATG encoding the CYP3A4 protein has been taken as position 1) an A, at a position corresponding to any one of position 14323, 14329, 21867, 21896, 22026, 22041, 23081 or 25925 of the CYP3A4 gene (Accession No: AF280107, whereby the nucleotide A of the first ATG encoding the CYP3A4 protein has been taken as position 1) a T, at a position corresponding to any one of position 14357, 15753 or 25958 of the CYP3A4 gene (Accession No: AF280107, whereby the nucleotide A of

the first ATG encoding the CYP3A4 protein has been taken as position 1) a G, at a position corresponding to any one of position 14304 of the CYP3A4 gene (Accession No: AF280107, whereby the nucleotide A of the first ATG encoding the CYP3A4 protein has been taken as position 1) a C or at a position corresponding to position 1229 of the CYP3A7 gene (Accession No: gi4503232) a G;

(e) a polynucleotide encoding an CYP3A4 polypeptide, wherein said polypeptide comprises an amino acid substitution at any one of position 56, 130, 170, 174, 363, 373, 416 or 445 of the CYP3A4 polypeptide (Accession No: AF280107), wherein said substitution at a position corresponding to position 445 is not M to T; and

(f) a polynucleotide encoding an CYP3A4 or CYP3A7 polypeptide, wherein said polypeptide comprises an amino acid substitution of G to D at position 56, R to Q at position 130, V to I at position 170, D to H at position 174, T to M at position 363, L to F at position 373 or P to L at position 416 of the CYP3A4 polypeptide (Accession No: AF280107) or T to R at position 409 of the CYP3A7 polypeptide (Accession No: gi4503232).

2. The polynucleotide of claim 1, wherein said polynucleotide encodes a variant CYP3A4 or CYP3A7 protein or fragment thereof.

3. The polynucleotide of claim 1 or 2, wherein the nucleotide deletion, addition and/or substitution result in altered expression of the variant CYP3A4 or CYP3A7 gene compared to the corresponding wild type gene.

4. A vector comprising the polynucleotide of any one of claims 1 to 3.

5. The vector of claim 4, wherein the polynucleotide is operatively linked to expression control sequences allowing expression in prokaryotic or eukaryotic cells.

6. A host cell genetically engineered with the polynucleotide of any one of claims 1 to 3 or the vector of claim 4 or 5.

7. A method for producing a molecular variant CYP3A4 or CYP3A7 protein or fragment thereof comprising
   (a) culturing the host cell of claim 6; and
   (b) recovering said protein or fragment from the culture.

8. A method for producing cells capable of expressing a molecular variant CYP3A4 or CYP3A7 gene comprising genetically engineering cells with the polynucleotide of any one of claims 1 to 3 or the vector of claim 4 or 5.

9. A CYP3A4 or CYP3A7 protein or fragment thereof encoded by the polynucleotide of any one of claims 1 to 3 or obtainable by the method of claim 7 or from cells produced by the method of claim 8.

10. An antibody which binds specifically to the protein of claim 9.

11. The antibody of claim 10 which specifically recognizes an epitope containing one or more amino acid substitution(s) as defined in any one of claims 1 to 3.

12. A nucleic acid molecule complementary to a polynucleotide of any one of claims 1 to 3.

13. A nucleic acid molecule capable of specifically recognizing and cleaving the polynucleotide of any one of claims 1 to 3.

14. A vector comprising the nucleic acid molecule of claim 12 or 13.

15. A transgenic non-human animal comprising at least one polynucleotide of any one of claims 1 to 3 or the vector of claim 4 or 5.

16. The transgenic non-human animal of claim 15 further comprising at least one inactivated wild type allele of the CYP3A4 or CYP3A7 gene.

17. The transgenic non-human animal of claim 15 or 16, which is a mouse or a rat.

18. A method of identifying and obtaining a CYP3A4 or CYP3A7 inhibitor capable of modulating the activity of a molecular variant of the CYP3A4 or CYP3A7 gene or its gene product comprising the steps of

(a) contacting the protein of claim 9 or a cell expressing a molecular variant CYP3A4 or CYP3A7 gene comprising a polynucleotide of any one of claims 1 to 3 in the presence of components capable of providing a detectable signal in response to drug metabolization, with a compound to be screened under conditions to permit CYP3A4- or CYP3A7-mediated drug metabolization, and

(b) detecting the presence or absence of a signal or increase of a signal generated from the drug metabolization, wherein the presence or increase of the signal is indicative for a putative inhibitor.

19. The method of claim 18 wherein said cell is a cell of claim 6, obtained by the method of claim 8 or is comprised in the transgenic non-human animal of any one of claims 15 to 17.

20. A method of identifying and obtaining an CYP3A4 or CYP3A7 inhibitor capable of modulating the activity of a molecular variant of the CYP3A4 or CYP3A7 gene or its gene product comprising the steps of

(a) contacting the protein of claim 9 with a first molecule known to be bound by CYP3A4 or CYP3A7 protein to form a first complex of said protein and said first molecule;

(b) contacting said first complex with a compound to be screened; and

(c) measuring whether said compound displaces said first molecule from said first complex.

21. The method of claim 20, wherein said measuring step comprises measuring the formation of a second complex of said protein and said compound.

22. The method of claim 20 or 21, wherein said measuring step comprises measuring the amount of said first molecule that is not bound to said protein.

23. The method of any one of claim 20 to 22 wherein said first molecule is nifedipine, rifampicine or corticosterone.

24. The method of any one of claims 20 to 23 wherein said first molecule is labeled.

25. A method of diagnosing a disorder related to the presence of a molecular variant of the CYP3A4 or CYP3A7 gene or susceptibility to such a disorder comprising

(a) determining the presence of a polynucleotide of any one of claim 1 to 3 in a sample from a subject; and/or

(b) determining the presence of a protein of claim 9.

26. The method of claim 25, wherein said disorder is cancer.

27. The method of claim 25 or 26 comprising PCR, ligase chain reaction, restriction digestion, direct sequencing, nucleic acid amplification techniques, hybridization techniques or immunoassays.

28. The method of any one of claims 25 to 27, further comprising administering to a subject a medicament to abolish or alleviate said disorder.

29. The method of any one of claims 25 to 28, further comprising introducing

(i) a functional and expressible wild type CYP3A4 or CYP3A7 gene or

(ii) a nucleotide acid molecule of claim 12 or 13 or the vector of claim 14 into cells.

30. A method for the production of a pharmaceutical composition comprising the steps of the method of any one of claims 18 to 24; and

(c) synthesizing and/or formulating the compound identified and obtained in step (b) or a derivative thereof in a pharmaceutically acceptable form.

31. A method for the preparation of a pharmaceutical composition comprising formulating a drug or pro-drug in the form suitable for therapeutic application

and preventing or ameliorating the disorder of the subject diagnosed in the method of claim 25 or 26.

32. The method of claim 30 or 31 wherein said compound drug or prodrug is a derivative of a medicament as defined in claim 28.

33. An inhibitor identified or obtainable by the method of any one of claims 18 to 24.

34. The inhibitor of claim 33 which binds specifically to the protein of claim 9.

35. Use of an oligo- or polynucleotide for the detection of a polynucleotide of any one of claims 1 to 3 and/or for genotyping of individual CYP3A4 or CYP3A7 alleles.

36. The use of claim 35 wherein said polynucleotide is a polynucleotide of any one of claims 1 to 3 or a nucleic acid molecule of claim 12 or 13.

37. The use of claim 35 wherein said oligonucleotide is about 15 to 50 nucleotides in length and comprises the nucleotide sequence of any one of SEQ ID NOS: 1 to 127, 140 or 141 or a complementary sequence.

38. A primer or probe consisting of an oligonucleotide as defined in claim 37.

39. Use of an antibody or a substance capable of binding specifically to the gene product of an CYP3A4 or CYP3A7 gene for the detection of the protein of claim 9, the expression of a molecular variant CYP3A4 or CYP3A7 gene comprising a polynucleotide of any one of claims 1 to 3 and/or for distinguishing CYP3A4 alleles comprising a polynucleotide of any one of claims 1 to 3.

40. A composition comprising the polynucleotide of any one of claims 1 to 3, the vector of claim 4 or 5, the host cell of claim 6 or obtained by the method of claim 8, the protein of claim 9, the antibody of claim 10 or 11, the nucleic acid molecule of claim 12 or 13, the vector of claim 14, the inhibitor of claim 33 or the primer or probe of claim 38.

41. The composition of claim 40 which is a diagnostic or a pharmaceutical composition.

42. Use of an effective dose of a drug or prodrug for the preparation of a pharmaceutical composition for the treatment or prevention of a disorder of a subject comprising a polynucleotide of any one of claims 1 to 3 in its genome.

43. The use of claim 42 wherein said disorder is cancer.